# Economic Development and Unequal Exchange among Nations —Analysis of the USA, Japanese and South Korean Economies for the Years 1960-1985 Using Total Labor Inputs—

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# Economic Development and Unequal Exchange among Nations

## – Analysis of the USA, Japanese and South Korean Economies for the Years 1960 – 1985 Using Total Labor Inputs –

*by* Akiko NAKAJIMA* and Hiroshi IZUMI**

## I Introduction (Objective of this Paper)

There has been much talk about unequal exchange of labor among nations, but there have not been any empirical studies of this matter. The aim of this paper is to provide evidence concerning the existence of unequal exchange among nations for the case of the USA, Japan and the Republic of Korea (hereafter abbreviated as ROK).

In order to measure the degree of unequal exchange of labor among nations, we first calculated the total labor input of each industry for each nation for each year. For this calculation each country's input output tables were used. Then the total labor input embodied in each nation's average exports and in its exports to a particular nation were calculated. The UN Commodity Trade Statistics and the export column within the columns of final demands of the input output tables were used for this calculation. Finally, such labor contents were compared among nations.

## II Model

### 2.1 Assumptions

In order to calculate the total labor inputs of each industry for the USA, Japan and ROK, the following assumptions are employed.

(1) All labor is regarded as necessary labor. That is, all labor employed including that in the service sector is counted.

(2) Actual depreciation costs are assumed to equal the value of depreciation allowances.

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Izumi did all the data processing and calculated Table 1. Nakajima arranged the SITC codes into input output classification. Then Izumi calculated table 2. Other tables and figures were prepared by Nakajima. The entire paper is written by Nakajima. Data sources is written by Izumi.

(3) The labor embodied in imported inputs are replaced by the labor embodied in the same value of exports.

(4) The economy is classified into 24 sectors. The classification employed is that used in "The 1985 Japan U.S. EC Asia Input Output Table" published by the Ministry of International Trade and Industry of the Government of Japan.

## 2.2 Basic theoretical definition[1)]

The total labor inputs of commodities produced in sector j is theoretically defined as follows:

$$t_j = \sum_i a_{ij} t_i + l_j \tag{1}$$

This can be written in vector form as follows:

$$T = TA + L \tag{2}$$

### 2.3.1 Monetary expression

Interindustry transaction tables are available only in monetary terms. Therefore the actual measured total labor inputs is as follows:

$$\frac{t_j}{p_j} = \sum_i a_{ij} \frac{p_i}{p_j} \frac{t_i}{p_i} + \frac{l_j}{p_j} \tag{3}$$

Asterisks will be suffixed to indicate monetary expressions. Thus, equation 3 in vector form is as follows:

$$T^* = L^*(I - A^*)^{-1} \tag{4}$$

### 2.3.2 Consideration of depreciation of fixed capital as a cost

Depreciation of fixed capital is added to intermediate inputs as a cost. For this calculation, depreciation allowances are assumed to be equal to actual depreciation costs. Then total depreciation costs are distributed among sectors according to the size of their capital stock in the capital formation table.

$$d_{ij} \frac{p_i}{p_j} = \frac{Z_j}{X_j} \frac{K_{ij} p_i}{\sum_i (K_{ij} p_i)} \tag{5}$$

$$\frac{t_j}{p_j} = \sum_i \left( \left( a_{ij} \frac{p_i}{p_j} + d_{ij} \frac{p_i}{p_j} \right) \frac{t_i}{p_i} \right) + \frac{l_j}{p_j} \tag{6}$$

$Z_j$ is the depreciation allowance of sector j, $X_j$ is the value of total production of sector j, and $K_{ij}P_i$ is the value of the stock of the i-th capital good used in sector j.

### 2.3.3 Evaluation of imported inputs

We have to calculate the total labor inputs of each industry's output. For this calculation, the foreign labor embodied in imported inputs is replaced by national (domestic) labor. For this replacement, the labor content of imported inputs is replaced by the total amount of national (domestic) labor embodied in the same value of exports.

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1) Please refer to the list of notations.

Input output tables of the non-competitive import type are used for this replacement in the case of Japan and ROK. In the case of the USA where only non-competitive import type transaction tables are available, domestic input coefficients are calculated assuming (i) there are no re-exports, and (ii) the ratio of imports to domestic produced goods is the same for intermediate demands and for final demands.

#### 2.3.3.1 Okishio's modelling

The determination of total labor inputs after taking account of imported inputs is as follows:

$$T^*=T^*(A^{d*}+D^*)+M^*t^{m*}+L^* \tag{7}$$

$$t^{m*}=T^* \cdot \hat{E}^* \tag{8}$$

The above equations can be transformed as follows:

$$T^*=(L^*+M^*t^{m*})(I-A^{d*}-D^*)^{-1} \tag{9}$$

$$t^{m*}=\frac{L^*(I-A^{d*}-D^*)^{-1} \cdot \hat{E}^*}{1-M^*(I-A^{d*}-D^*)^{-1} \cdot \hat{E}^*} \tag{10}$$

where $t^{m*}$ is a scalar and both nominator and denominator of (10) are scalars. The method of calculation is to calculate $T^{d*}=L^*(I-A^{d*}-D^*)^{-1}$, then equation (10), and finally equation (9).

#### 2.3.3.2 Nakajima's Method

On the other hand, because $t^{m*}$ is a scalar (7) and (8) can be transformed as follows:

$$T^*=L^*(I-A^{d*}-D^*-\hat{E}^*M^*)^{-1} \tag{11}$$

Estimations based on (9) (10), and (11) give the same results.

#### 2.3.3.3 Izumi (Wolff)'s method

Add a row vector of import input coefficients below an ordinary input output coefficient matrix, and add a column vector of export components to the right of the matrix. This will give a square matrix of size n+1.

$$\begin{pmatrix} \alpha^*_{11} & \alpha^*_{1n} & e^*_1 \\ \cdot & \cdot & \vdots \\ \cdot & \cdot & \vdots \\ \alpha^*_{n1} & \alpha^*_{nn} & e^*_n \\ m^*_1 \cdots\cdots & m^*_n & 0 \end{pmatrix} \tag{12}$$

where $\alpha^*_{ij}=\alpha^{d*}_{ij}+d^*_{ij}$ for any i,j.

Set the (n+1)th factor of the direct labor coefficient vector to 0 and calculate the total labor inputs as if the number of sectors were equal to n+1. When the (n+1)th sector's total labor inputs is denoted as $t^{m*}$, what we are calculating is as follows:

$$\frac{t_j}{p_j}=\sum_i \left(a_{ij}^d\frac{p_i}{p_j}+d_{ij}\frac{p_i}{p_j}\right)\frac{t_i}{p_i}+m^*_j t^{m*}+\frac{l_j}{p_j} \tag{13}$$

Table 1

U.S.A.
Total Labour Inputs by Industry
Unit: Man hour/1000 US Dollar

| | | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 |
|---|---|---|---|---|---|---|---|
| 1 | Agriculture, forestry, fishery | 494.86 | 368.11 | 250.86 | 154.48 | 110.22 | 83.77 |
| 2 | Mining | 240.47 | 191.92 | 150.85 | 77.82 | 45.59 | 38.40 |
| 3 | Foodstuffs | 338.05 | 255.76 | 183.12 | 114.86 | 88.43 | 62.90 |
| 4 | Textiles | 381.83 | 300.40 | 227.31 | 160.69 | 106.51 | 79.41 |
| 5 | Pulp, paper, wood products | 340.37 | 254.57 | 199.32 | 132.83 | 86.69 | 65.23 |
| 6 | Chemicals | 237.52 | 178.22 | 148.00 | 95.26 | 71.59 | 50.74 |
| 7 | Oil products | 221.53 | 169.59 | 138.17 | 89.32 | 56.34 | 40.77 |
| 8 | Ceramics, sand and stone | 272.35 | 219.95 | 162.76 | 119.80 | 79.25 | 57.55 |
| 9 | Iron and steel, iron and steel products (including coke) | 250.09 | 196.97 | 155.60 | 100.62 | 76.79 | 52.20 |
| 10 | Nonferrous metals | 259.00 | 202.23 | 189.58 | 117.23 | 83.51 | 67.78 |
| 11 | Metal products | 289.10 | 223.75 | 180.34 | 109.28 | 79.20 | 56.65 |
| 12 | Ordinary machinary | 275.94 | 212.85 | 169.03 | 101.08 | 68.65 | 50.77 |
| 13 | Electric machinary | 279.80 | 205.78 | 153.34 | 137.18 | 94.29 | 72.03 |
| 14 | Automobiles | 259.59 | 195.41 | 155.85 | 106.28 | 79.21 | 53.41 |
| 15 | Other transport machinery | 269.86 | 217.45 | 180.80 | 123.03 | 79.23 | 57.88 |
| 16 | Precision machinery | 295.52 | 225.25 | 181.71 | 120.31 | 80.24 | 62.68 |
| 17 | Other manufactured goods | 288.46 | 215.54 | 178.61 | 122.21 | 80.36 | 58.41 |
| 18 | Construction | 278.81 | 220.10 | 170.29 | 111.51 | 78.61 | 58.63 |
| 19 | Electric power, tap water, gas | 229.75 | 171.97 | 159.07 | 101.53 | 67.86 | 42.47 |
| 20 | Commerce | 351.45 | 276.90 | 206.78 | 160.59 | 97.31 | 80.00 |
| 21 | Transportation | 306.94 | 242.75 | 187.02 | 128.84 | 81.44 | 59.30 |
| 22 | Other services | 273.49 | 205.78 | 154.02 | 114.24 | 75.33 | 54.30 |
| 23 | Government activities | 340.39 | 269.38 | 210.22 | 72.05 | 50.88 | 34.20 |
| 24 | Activities not elsewhere classified, others | 293.57 | 218.75 | 0.00 | 285.59 | 199.77 | 140.93 |
| 25 | Imports | 281.43 | 236.71 | 179.70 | 124.07 | 84.78 | 60.92 |

$$t^{m}*=\sum_{i} e^{*}_{i}\frac{t_i}{p_i} \tag{14}$$

These equations are equal to the Okishio's definitions given earlier and therefore Izumi (Wolff)'s method gives the same results. When we use Izumi (Wolff)'s method we have to calculate an inverse matrix of size n+1. However, this method is very simple, and the total labor input of imports (exports) are calculated together with all the other total labor inputs of each sector.

## List of notations

$A$ Input output coefficient matrix in physical terms

$A^*$ Input output coefficient matrix in monetary terms, i.e., $a^{*}_{ij}=a_{ij}\frac{p_i}{p_j}$

$A^{d}*$ Input output coefficient matrix of domestically produced inputs only, i.e., $A^*=A^{d}*+A^{m}*$

$A^{m}*$ Input output coefficient matrix of imported inputs only

$D$ Depreciation coefficient matrix of fixed capital

Table 1

Japan
Total Labour Inputs by Industry
Unit: Man hour/1000 Dollar

| | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 |
|---|---|---|---|---|---|---|
| 1 | 5385.43 | 2741.15 | 1726.64 | 609.75 | 331.00 | 277.01 |
| 2 | 2597.90 | 1429.95 | 644.59 | 265.50 | 114.72 | 111.12 |
| 3 | 3600.82 | 1889.04 | 1033.19 | 397.47 | 189.17 | 160.27 |
| 4 | 3609.63 | 1087.65 | 1099.52 | 418.96 | 196.06 | 181.36 |
| 5 | 3693.95 | 1867.37 | 890.34 | 349.10 | 170.04 | 135.85 |
| 6 | 2412.67 | 1288.40 | 558.10 | 245.58 | 119.52 | 95.55 |
| 7 | 1609.56 | 857.27 | 386.51 | 234.84 | 116.60 | 90.79 |
| 8 | 2626.90 | 1434.39 | 677.64 | 281.49 | 134.79 | 112.29 |
| 9 | 2184.98 | 1308.96 | 550.89 | 237.08 | 110.00 | 93.08 |
| 10 | 2897.74 | 1331.52 | 610.23 | 244.27 | 116.04 | 106.95 |
| 11 | 2576.99 | 1450.03 | 663.73 | 281.55 | 140.97 | 121.45 |
| 12 | 2376.81 | 1326.48 | 586.52 | 260.32 | 128.84 | 104.92 |
| 13 | 2439.32 | 1377.09 | 640.64 | 280.95 | 129.50 | 113.07 |
| 14 | 2441.83 | 1317.73 | 634.72 | 242.36 | 128.81 | 108.84 |
| 15 | 2356.84 | 1352.05 | 655.05 | 256.10 | 128.90 | 106.72 |
| 16 | 2595.05 | 1507.48 | 711.77 | 294.70 | 140.47 | 117.23 |
| 17 | 3119.63 | 1667.71 | 782.71 | 315.75 | 153.41 | 124.03 |
| 18 | 2989.43 | 1642.87 | 751.46 | 301.09 | 152.86 | 136.86 |
| 19 | 1960.80 | 1058.09 | 483.78 | 220.73 | 102.97 | 91.05 |
| 20 | 3663.99 | 1845.59 | 864.66 | 366.68 | 170.16 | 154.82 |
| 21 | 2523.55 | 1442.61 | 728.99 | 280.21 | 141.28 | 123.92 |
| 22 | 2439.89 | 1275.21 | 646.82 | 242.32 | 126.71 | 107.65 |
| 23 | 1611.65 | 1138.29 | 628.52 | 235.45 | 134.69 | 113.51 |
| 24 | 2884.77 | 1601.70 | 604.43 | 290.87 | 138.67 | 109.54 |
| 25 | 2982.71 | 1550.34 | 710.00 | 274.83 | 134.90 | 114.91 |

$T$ Total labor input vector (row vector) in physical terms

$T^*$ Total labor input vector (row vector) in monetary terms i.e., $t_j^*=\frac{t_j}{p_j}$

$L$ Direct labor input coefficient vector (row vector)

$L^*$ Direct labor input coefficient vector in monetary terms (row vector) i.e., $l_j^*=\frac{l_j}{p_j}$

$M^*$ Import input coefficient vector ($1\times$n row vector) i.e., $m_j=\sum_i a^m{}^*_{ij}$

$\acute{E}^*$ Export component vector ($1\times$n column vector) i.e., $e_j^*=\frac{E_j^*}{\sum_i E_j^*}$ $e_j^*$ is the share of exports from sector j in total exports

$\sum_j e_j^*=1$

$t_m^*$ Total labor input embodied in one monetary unit of imports (scalar)

Table 1

Republic of Korea
Total Labour Inputs by Industry
Unit: Man hour/1000 US Dollar

| | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 |
|---|---|---|---|---|---|---|
| 1 | 10197.97 | 9442.81 | 4292.14 | 2234.46 | 942.60 | 646.52 |
| 2 | 2647.85 | 4438.84 | 2316.40 | 1391.06 | 527.18 | 482.04 |
| 3 | 4850.93 | 5672.8 | 2466.79 | 1410.59 | 697.07 | 492.65 |
| 4 | 4370.25 | 5914.62 | 2872.24 | 1922.57 | 711.27 | 547.18 |
| 5 | 5812.13 | 5200.91 | 2564.04 | 1586.00 | 638.09 | 463.93 |
| 6 | 3746.71 | 4405.93 | 1996.20 | 1301.66 | 470.10 | 378.62 |
| 7 | 0.00 | 3399.11 | 1846.02 | 1287.96 | 531.02 | 392.92 |
| 8 | 3437.50 | 4714.29 | 2112.68 | 1325.79 | 513.60 | 409.26 |
| 9 | 3089.31 | 4678.68 | 2206.59 | 1401.18 | 512.37 | 404.03 |
| 10 | 2766.49 | 4690.47 | 2239.04 | 1299.48 | 568.43 | 433.32 |
| 11 | 3671.67 | 5608.86 | 2757.58 | 1549.58 | 559.88 | 421.91 |
| 12 | 3528.25 | 5176.56 | 2507.72 | 1444.61 | 533.30 | 416.69 |
| 13 | 3843.06 | 4755.53 | 2296.69 | 1406.21 | 574.66 | 443.32 |
| 14 | 0.00 | 0.00 | 2098.27 | 1371.08 | 555.11 | 388.17 |
| 15 | 3540.24 | 4055.00 | 2323.62 | 1416.46 | 526.47 | 420.10 |
| 16 | 0.00 | 0.00 | 2574.26 | 1585.17 | 581.89 | 468.71 |
| 17 | 3708.02 | 5257.65 | 2805.10 | 1686.69 | 671.11 | 483.36 |
| 18 | 3860.32 | 4683.91 | 2176.06 | 1407.27 | 492.30 | 402.52 |
| 19 | 2654.65 | 3063.28 | 1224.91 | 1111.67 | 401.62 | 287.97 |
| 20 | 4958.99 | 6028.02 | 2649.25 | 1439.87 | 708.74 | 593.77 |
| 21 | 3648.61 | 4454.84 | 2199.60 | 1455.13 | 528.54 | 420.70 |
| 22 | 2553.41 | 5145.54 | 2547.35 | 1476.14 | 547.42 | 409.07 |
| 23 | 0.00 | 0.00 | 0.00 | 0.00 | 542.16 | 416.98 |
| 24 | 2020.92 | 5202.96 | 2472.37 | 1426.26 | 644.64 | 508.00 |
| 25 | 4938.34 | 5411.7 | 2670.56 | 1636.38 | 620.42 | 470.18 |

## III Findings

The total labor inputs of each industry for the U.S.A., Japan and ROK were calculated for the years 1960,65,70,75,80 and 1985 as can be seen in Table 1. Then, the average labor content of each country's exports were calculated using the export column vector within the final demands and the UN Commodity Trade Statistics. From such calculations, we obtained the following findings.

### 3.1. Existence of clear unequal exchange of labor

The average labor inputs embodied in exports are shown in Table 2. The first row shows the average labor inputs embodied in the exports of the U.S.A. to all countries, and the second and third rows indicate the average labor inputs embodied in the exports of the U.S.A to a particular country (in this case to Japan and ROK.)

The ratio of these labor inputs were calculated and are shown in Table 3 and in Figure 1. This figure shows clearly the existence of the unequal exchange of labor. The degree of unequal exchange was great in the past (as high as 24 times between the U.S. and R.O.K and 10 times between the U.S. and Japan). Such unequal exchange of labor in exports still exists at present.

Table 2 Average Total Labour Inputs in Exports

unit: Man×Hour/1000 dollars

| | | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 |
|---|---|---|---|---|---|---|---|
| U.S.A. | Total Exports | 281.43 | 236.71 | 179.70 | 124.07 | 84.78 | 60.92 |
| | Exports to Japan | 350.90 | 275.78 | 192.05 | 123.60 | 86.65 | 64.07 |
| | Exports to R.O.K. | 330.05 | 273.03 | 201.40 | 135.42 | 90.85 | 65.04 |
| Japan | Total Exports | 2995.80 | 1550.34 | 710.00 | 274.83 | 134.90 | 114.91 |
| | Exports to U.S.A. | 3029.97 | 1600.38 | 712.09 | 271.22 | 131.75 | 111.67 |
| | Exports to R.O.K. | 2639.86 | 1507.39 | 864.39 | 282.39 | 135.21 | 111.70 |
| R.O.K. | Total Exports | 4938.34 | 5411.70 | 2670.56 | 1636.38 | 620.42 | 470.18 |
| | Exports to U.S.A. | 6221.34 | 5804.56 | 2780.86 | 1704.38 | 635.58 | 479.30 |
| | Exports to Japan | 6108.53 | 6804.88 | 2961.10 | 1784.32 | 688.16 | 490.77 |

Table 3 Ratio of Labor Embodied in Export (Degree of Unequal Exchange among Nations)

| | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 |
|---|---|---|---|---|---|---|
| Japan/U.S.A. | 10.64 | 6.55 | 3.95 | 2.22 | 1.59 | 1.89 |
| (J→U.S)/(U.S→J) | 8.63 | 5.80 | 3.71 | 2.19 | 1.52 | 1.74 |
| Korea/U.S.A. | 17.55 | 22.86 | 14.86 | 13.19 | 7.32 | 7.72 |
| (K→U.S)/(U.S→K) | 18.85 | 21.26 | 13.81 | 12.59 | 7.00 | 7.37 |
| Korea/Japan | 1.65 | 3.49 | 3.76 | 5.95 | 4.60 | 4.09 |
| (K→J/(J→K) | 2.31 | 4.51 | 3.43 | 6.32 | 5.09 | 4.39 |

In the process of making Table 2 and Table3, exchange rates (between currencies) were used. It may be worth noting that the Korean currency has depreciated 400% against the U.S. dollar between 1960 and 1965, and continued to depreciate until 1980.

A comparison of the average labor inputs of exports with the average labor inputs of all industries indicates that industries that have a comparative advantage are not always the export industry.

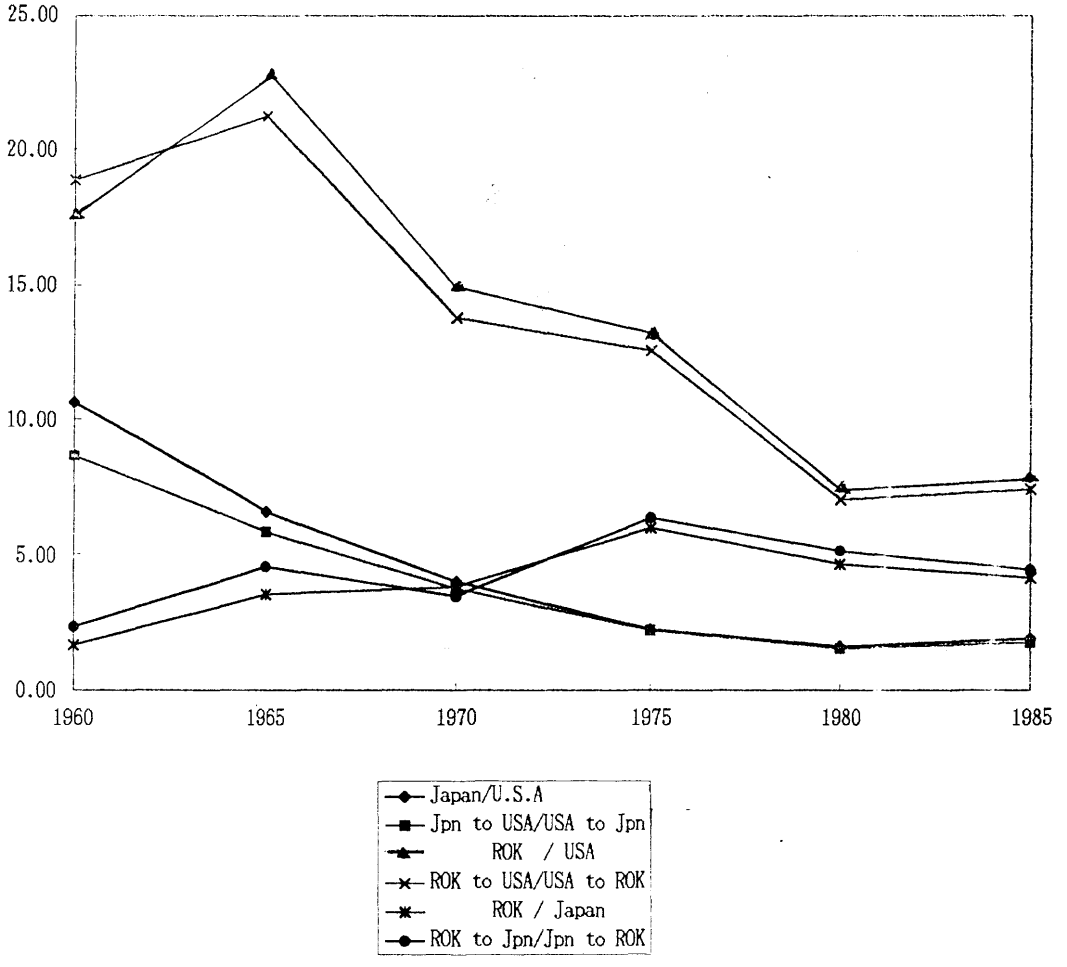
### 3.2 Unequal exchange decreases as a result of economic development

The degree of unequal exchange of labor of exports are measured by the ratio of the total labor inputs of exports (Figure 1).

It is clear that the Japanese and Korean economies have developed at a much higher speed than the U.S. and that the degree of unequal exchange has declined (Figure 1).

The degree of unequal exchange between ROK and Japan has improved since 1975 (Figure 1). Japanese economic growth slowed down from about this year, so the relative economic development of Korea became more significant. (Please reter to Table 6)

Figure 1 Degree of Unequal Exchange Among Nations




### 3.3 Factor analysis

The unequal exchange of labor can be decomposed into three factors: namely, (i) differences of labor productivity, (ii) differences in prices including differences in existing exchange rates and PPP exchange rates and (iii) differences in the composition of exports.

### 3.4 Unequal exchange of labor among industries within a nation

Basically, it is difficult to make statements about the unequal exchange of labor among different industries within a nation. Two indicators of the degree of unequal exchange among industries were formulated.

The first indicator is

$$\frac{\sqrt{\sum_i (t_i-\bar{t})^2/n}}{\bar{t}} \times 100 \tag{15}$$

$$\bar{t} = \frac{\sum_i t_i}{n} \tag{16}$$

The second indicator is

$$\frac{\sqrt{\sum_i \left((t_i-\tilde{t})^2 \frac{x_i}{\sum_i x_i}\right)}}{\tilde{t}} \times 100 \tag{17}$$

$$\tilde{t} = \sum_i \left(t_i \frac{x_i}{\sum_i x_i}\right) \tag{18}$$

where $X_i$ is total outputs of sector i.

The degree of unequal exchange among industries was measured by indicator (1) in Table 4, and by indicator (2) in Table 5.

These two indicators show that (i) the unequal exchange of labor among industries within the U.S.A is low. (ii) There is a decreasing trend of unequal exchange in the case of ROK. The first finding may be related to the fact that there is not a big difference in the total labor inputs of the agricultural sector and the non-agricultural sector in the case of the U.S.A. The second finding may be partly due to the fact that the economic situation and thus the sectoral composition of R.O.K. was very different in 1960, as a result of which the degree of unequal exchange was high to begin with.

Table 4 Degree of Unequal Exchange among Industries (1)

| | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 |
|---|---|---|---|---|---|---|
| U.S.A. | 19.58% | 19.18% | 25.90% | 32.88% | 33.63% | 33.45% |
| Japan | 28.56% | 24.79% | 35.44% | 27.76% | 30.59% | 30.77% |
| R.O. Korea | 64.66% | 45.78% | 30.61% | 25.96% | 18.27% | 16.31% |

Table 5 Degree of Unequal Exchange among Industries (2)

| | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 |
|---|---|---|---|---|---|---|
| U.S.A. | 19.66% | 18.95% | 15.24% | 20.65% | 19.16% | 22.13% |
| Japan | 29.66% | 25.25% | 33.69% | 27.37% | 26.58% | 26.58% |
| R.O. Korea | 55.18% | 31.09% | 33.21% | 24.67% | 21.38% | 18.02% |

Table 6

U.S.A.
Value of Total Output
Unit: Million U.S. Dollars

| | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 |
|---|---|---|---|---|---|---|
| 1 | 52,671 | 59,709 | 75,663 | 118,457 | 174,460 | 191,098 |
| 2 | 17,658 | 20,757 | 26,906 | 58,482 | 147,757 | 165,084 |
| 3 | 74,237 | 88,226 | 123,964 | 189,184 | 273,801 | 325,169 |
| 4 | 31,864 | 41,954 | 54,384 | 65,423 | 101,357 | 115,653 |
| 5 | 28,202 | 39,928 | 50,295 | 77,101 | 138,764 | 172,120 |
| 6 | 27,738 | 40,258 | 54,834 | 88,990 | 172,573 | 206,162 |
| 7 | 18,968 | 23,530 | 29,357 | 68,348 | 190,587 | 175,585 |
| 8 | 10,591 | 13,435 | 19,424 | 26,258 | 45,223 | 53,492 |
| 9 | 20,801 | 27,103 | 40,052 | 52,656 | 77,459 | 61,139 |
| 10 | 10,651 | 16,028 | 20,197 | 29,445 | 58,355 | 48,287 |
| 11 | 21,547 | 31,176 | 42,599 | 63,407 | 108,784 | 128,782 |
| 12 | 27,296 | 44,166 | 60,981 | 91,705 | 177,772 | 205,664 |
| 13 | 25,437 | 39,971 | 60,528 | 62,633 | 131,575 | 195,699 |
| 14 | 26,817 | 41,537 | 48,365 | 70,837 | 103,630 | 187,244 |
| 15 | 17,179 | 24,278 | 29,205 | 39,197 | 78,747 | 98,501 |
| 16 | 6,173 | 8,665 | 13,144 | 19,139 | 37,726 | 51,089 |
| 17 | 36,752 | 51,990 | 72,865 | 76,045 | 138,657 | 198,372 |
| 18 | 74,159 | 94,297 | 126,191 | 194,589 | 367,669 | 491,748 |
| 19 | 29,750 | 41,807 | 48,090 | 99,656 | 205,307 | 316,980 |
| 20 | 105,180 | 141,989 | 204,702 | 273,694 | 563,235 | 727,513 |
| 21 | 35,693 | 44,830 | 62,104 | 97,920 | 187,926 | 241,393 |
| 22 | 219,250 | 305,269 | 466,611 | 793,753 | 1,463,532 | 2,384,970 |
| 23 | 44,425 | 68,342 | 109,842 | 172,650 | 280,056 | 406,738 |
| 24 | 2,793 | 1,242 | 0 | 6,519 | 8,872 | 13,025 |
| 25 | 97,590 | 31,490 | 49,766 | 123,464 | 254,275 | 261,352 |
| Sum | 965,832 | 1,310,487 | 1,840,303 | 2,836,088 | 5,233,824 | 7,161,507 |
| | | 1.36 | 1.40 | 1.54 | 1.85 | 1.37 |
| Growth Rate | | 2.65% | 2.95% | 3.76% | 5.32% | 2.72% |

Table 6

Japan
Value of Total Output
Unit: Million Yen

| | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 |
|---|---|---|---|---|---|---|
| 1 | 3,112 | 4,746 | 7,114 | 13,038 | 16,111 | 17,746 |
| 2 | 380 | 574 | 959 | 1,511 | 2,601 | 1,925 |
| 3 | 3,739 | 5,935 | 9,876 | 19,008 | 26,954 | 37,227 |
| 4 | 2,305 | 3,511 | 5,928 | 9,055 | 11,670 | 13,444 |
| 5 | 1,743 | 3,353 | 6,980 | 10,925 | 17,415 | 16,894 |
| 6 | 1,462 | 2,874 | 5,917 | 11,019 | 19,685 | 22,868 |
| 7 | 381 | 1,031 | 2,373 | 7,788 | 15,437 | 16,085 |
| 8 | 523 | 1,024 | 2,670 | 4,875 | 8,255 | 8,556 |
| 9 | 2,918 | 4,419 | 11,904 | 21,021 | 31,415 | 27,314 |
| 10 | 582 | 960 | 2,508 | 3,095 | 7,036 | 6,295 |
| 11 | 410 | 947 | 3,505 | 6,254 | 10,409 | 11,588 |
| 12 | 1,361 | 2,370 | 7,472 | 11,213 | 18,770 | 26,405 |
| 13 | 1,225 | 2,134 | 7,104 | 10,369 | 22,178 | 38,887 |
| 14 | 1,153 | 2,560 | 6,761 | 13,961 | 25,827 | 33,372 |
| 15 | 467 | 936 | 1,806 | 3,549 | 4,171 | 5,355 |
| 16 | 171 | 397 | 946 | 1,614 | 3,428 | 4,045 |
| 17 | 1,088 | 2,295 | 5,180 | 10,128 | 18,048 | 24,283 |
| 18 | 3,181 | 6,640 | 16,259 | 34,074 | 55,257 | 56,018 |
| 19 | 649 | 1,311 | 2,628 | 6,642 | 14,751 | 20,484 |
| 20 | 2,609 | 5,939 | 14,290 | 30,053 | 51,518 | 61,148 |
| 21 | 1,618 | 3,259 | 6,597 | 20,706 | 35,250 | 27,456 |
| 22 | 4,902 | 11,547 | 26,991 | 67,639 | 118,163 | 169,966 |
| 23 | 825 | 1,281 | 2,251 | 8,581 | 13,275 | 17,057 |
| 24 | 1,925 | 2,984 | 6,664 | 12,816 | 17,604 | 20,398 |
| 25 | 1,720 | 3,431 | 8,545 | 20,077 | 34,543 | 47,545 |
| Sum | 38,828 | 73,027 | 164,680 | 338,932 | 565,226 | 684,815 |
| | 1.88 | 2.26 | 2.06 | 1.67 | 1.21 | |
| Growth Rate | 5.49% | 7.06% | 6.27% | 4.44% | 1.67% | |

Table 6

R.O. KOREA
Value of Total Output
Unit: Million Won

| | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 |
|---|---|---|---|---|---|---|
| 1 | 95,003 | 402,903 | 932,408 | 2,987,441 | 7,797,221 | 14,643,322 |
| 2 | 7,090 | 24,797 | 61,481 | 213,730 | 737,750 | 1,353,537 |
| 3 | 35,176 | 128,765 | 452,597 | 1,281,368 | 10,072,488 | 17,363,056 |
| 4 | 26,511 | 115,101 | 378,142 | 2,074,523 | 7,128,425 | 12,731,603 |
| 5 | 7,345 | 38,454 | 122,390 | 476,883 | 1,975,444 | 3,510,149 |
| 6 | 5,146 | 29,828 | 170,965 | 1,255,866 | 5,570,552 | 9,293,053 |
| 7 | 0 | 12,302 | 93,943 | 905,574 | 4,531,838 | 7,098,726 |
| 8 | 3,810 | 17,884 | 75,650 | 338,418 | 1,762,679 | 3,376,353 |
| 9 | 6,817 | 33,728 | 128,887 | 796,004 | 4,967,982 | 9,452,672 |
| 10 | 734 | 4,396 | 14,381 | 90,762 | 574,653 | 1,211,161 |
| 11 | 3,384 | 9,768 | 32,044 | 193,591 | 1,176,500 | 3,204,901 |
| 12 | 2,995 | 9,562 | 26,273 | 177,397 | 1,305,370 | 4,354,592 |
| 13 | 853 | 11,491 | 63,288 | 680,791 | 3,494,830 | 8,455,073 |
| 14 | 0 | 0 | 63,312 | 204,388 | 918,493 | 3,019,704 |
| 15 | 2,643 | 18,961 | 27,552 | 217,776 | 755,734 | 3,021,488 |
| 16 | 0 | 0 | 7,335 | 57,751 | 367,564 | 739,164 |
| 17 | 13,065 | 46,925 | 144,748 | 738,815 | 3,329,722 | 8,834,040 |
| 18 | 20,244 | 100,332 | 475,197 | 1,409,900 | 7,492,407 | 15,462,488 |
| 19 | 7,954 | 18,100 | 65,444 | 342,317 | 2,016,033 | 4,459,418 |
| 20 | 26,774 | 137,478 | 492,540 | 1,887,900 | 6,627,864 | 12,522,517 |
| 21 | 17,215 | 61,105 | 271,642 | 1,043,940 | 4,909,638 | 9,208,151 |
| 22 | 65,907 | 166,412 | 638,241 | 2,214,550 | 11,198,540 | 27,995,888 |
| 23 | 0 | 0 | 139,644 | 399,931 | 3,416,597 | 6,264,846 |
| 24 | 7,116 | 44,184 | 148,762 | 460,734 | 1,509,200 | 3,088,075 |
| 25 | 9,676 | 86,036 | 376,004 | 2,824,499 | 12,467,197 | 27,716,992 |
| Sum | 355,782 | 1,432,476 | 5,026,866 | 20,450,350 | 93,637,524 | 190,663,977 |
| | 4.03 | 3.51 | 4.07 | 4,58 | 2.04 | |
| Growth Rate | 12.10% | 10.90% | 12.19% | 13,21% | 6.18% | |

## IV Conclusion

Our findings confirm the existence of unequal exchange of labor among nations and show that such unequal exchange among nations decreases along with economic development in the case of the U.S.A., Japan and R.O. Korea.

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